

**SUMMARY OF GROUND WATER CONDITIONS
IN THE
BANCROFT-LUND
GROUND WATER MANAGEMENT AREA**

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TABLE OF CONTENTS

INTRODUCTION	1
History	1
Previous Work	1
Site Description	1
HYDROGEOLOGY	3
Geologic Framework	3
Occurrence and Movement of Ground Water	7
Recharge Versus Discharge	7
CONCLUSIONS	12
REFERENCES	13

LIST OF FIGURES

Figure 1. Site Location Map	2
Figure 2. Water Use	4
Figure 3. Climatic Data	5
Figure 4. Surface Water Data	6
Figure 5. Geologic Map	8
Figure 6. Ground Water Contours	9
Figure 7. Cross Section	10
Figure 8. Area Hydrographs	11

INTRODUCTION

History

Surface water irrigation development in the Bancroft-Lund area began at the turn of the century. Ground water development began in the 1950's. By the 1980's, well interference problems and concern that extensive ground water development would effect spring flow, became significant issues. Spring flow in the area is tributary to Bear River.

Because of these concerns, the Idaho Department of Water Resources established the Bancroft-Lund Ground Water Management Area 1991. Technical basis for this was the interrelationship between ground water and spring flow into Bear River at Black Canyon. Permits to appropriate ground water are still considered, but consumptive uses larger than stock, domestic, and subdivision (one-half acre maximum irrigation per lot) will only be approved if it can be shown no injury to senior users will occur or if the depletion can be mitigated.

Previous Work

Dion (1969) reported on the Bear River Basin in Idaho. Norvitch and Larson (1970) studied the entire Portneuf River Basin. Norton (1981) conducted an investigation in Gem Valley that focused mainly on well interference. Young (1984) conducted a mass well measurement in Gem Valley which resulted in the most complete ground water level data set for the area. Baker (1989) studied Gem Valley to define the ground water divide between the Bear and Portneuf Basins and assess factors affecting spring flow. Baker (1990), also assessed trends in ground water levels.

Site Description

The area is located in Southeastern Idaho in Caribou County (see Figure 1, "Site Location Map"). The Portneuf Valley, which is tributary to the Snake River lies to the north while Gem Valley lies to the south. Gem Valley is tributary to both the Snake and Bear River with a ground water divide separating the Valley.

Bear River enters Gem Valley from the east through a divide between the Soda Springs Hills to the north and the Bear River Range to the south. From this point the Bear River flows south, dropping several hundred feet through Black Canyon into

BANCROFT-LUND AREA

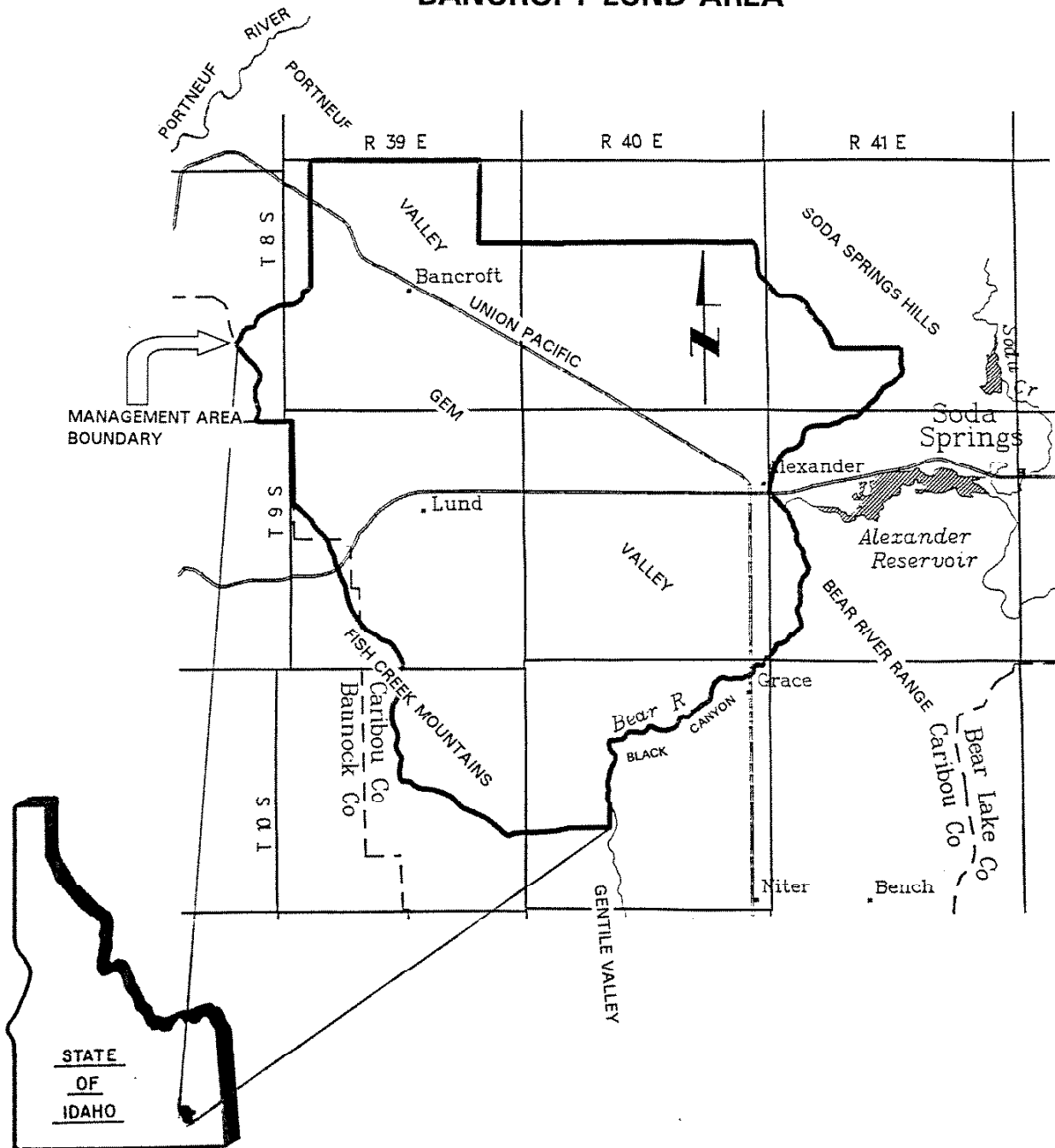


Figure 1. Site Location Map

Gentile Valley, south of the management area. The Fish Creek Mountains lie to the west. Elevation ranges from approximately 5000 feet on the valley floors to over 7000 feet in the surrounding mountains.

Figure 2, "Water Use", presents the distribution and use for wells in the area based on the amount recorded in the IDWR and USGS data base. The major uses, as would be expected, are irrigation and domestic.

Precipitation (see Figure 3, "Climatic Data") varies from approximately 15 inches on the valley floor (based on a precipitation station in Grace) to approximately 20 inches (Snow Water Equivalent) in the surrounding Mountains. The Snow water equivalent is from a snow course located at Slug Creek Divide approximately 12 miles east of the management area.

While neither show the exact same trend, periods of increasing and decreasing precipitation are approximately the same. The cumulative departure should be more representative of ground water level trends because ground water typically reflects cumulative trends in precipitation. Please note the snow data shows an overall decrease since the late 1960's while the cumulative for it shows an increase until the start of the recent drought. The reason for this is that the snow water equivalent, until the beginning of the current drought, has usually been above average. Therefore, the cumulative should be increasing.

Figure 4, "Surface Water Data", presents flow data for Bear River at Alexander and Oneida (30 miles south of Grace on the Bear River) along with the reach gain since 1961. The historic diversion for the Last Chance and Bench B canals are also presented. While the data presented dates back to only 1961, surface water has been diverted since the turn of the century. All are plotted at the same scale. The reach gain and diversion data are also plotted with an expanded vertical scale.

The reach gain and the diversion data only amount to 25 and 10 percent respectively of the total flow at Oneida. Also, while the reach gain shows a dramatic decline since 1984, it is not that far below average and is about the same level as it was in the late 1970's. Diversion data has shown a steady decrease since the mid 1970's.

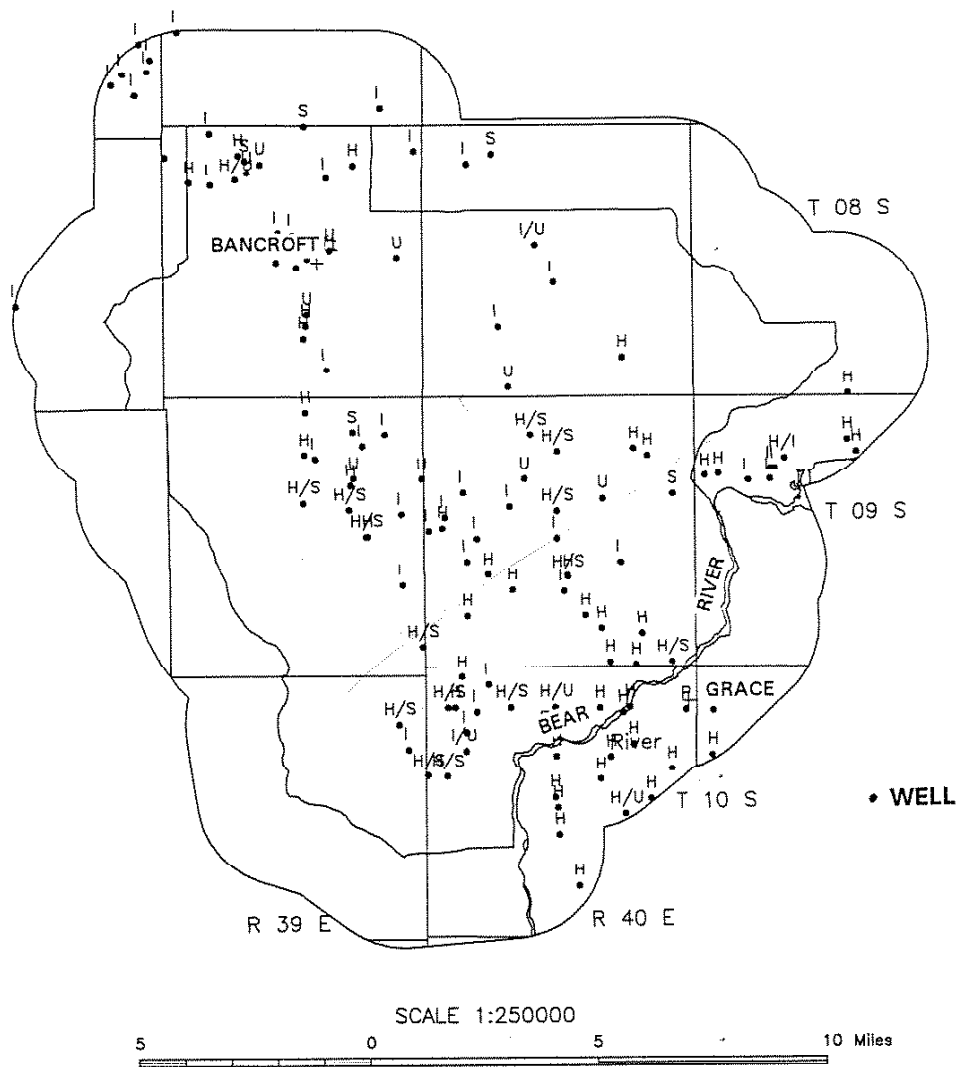
HYDROGEOLOGY

Geologic Framework

The following is a brief geologic description as presented by Norton (1981).

Approximately 34,000 years ago the drainage for Gem and Gentile Valleys, and the

BANCROFT-IUND GROUND WATER MANAGEMENT AREA



I = IRRIGATION S = STOCK H = DOMESTIC U = UNUSED P = PUBLIC SUPPLY

Figure 2. Water Use

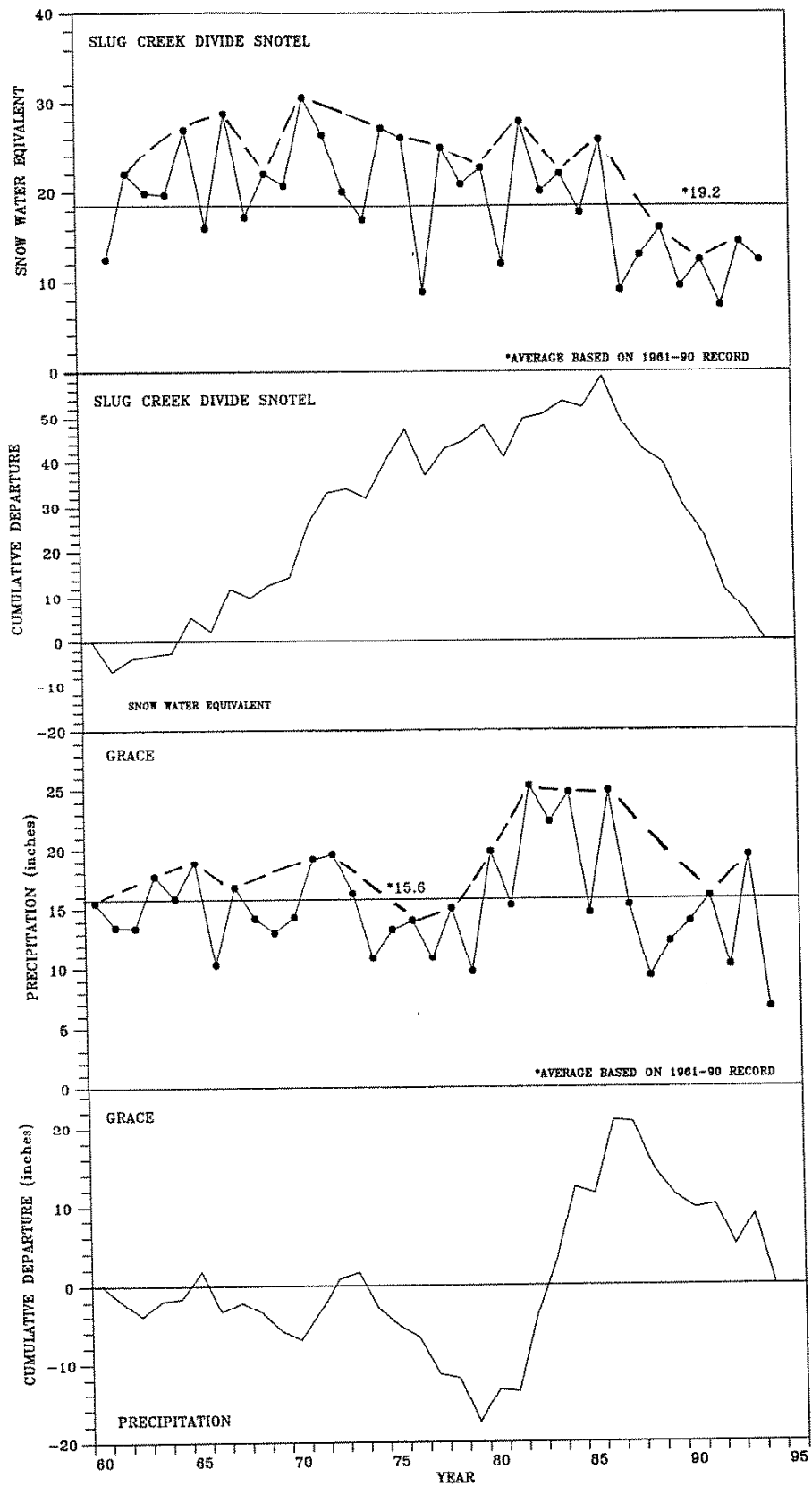


Figure 3. Climatic Data

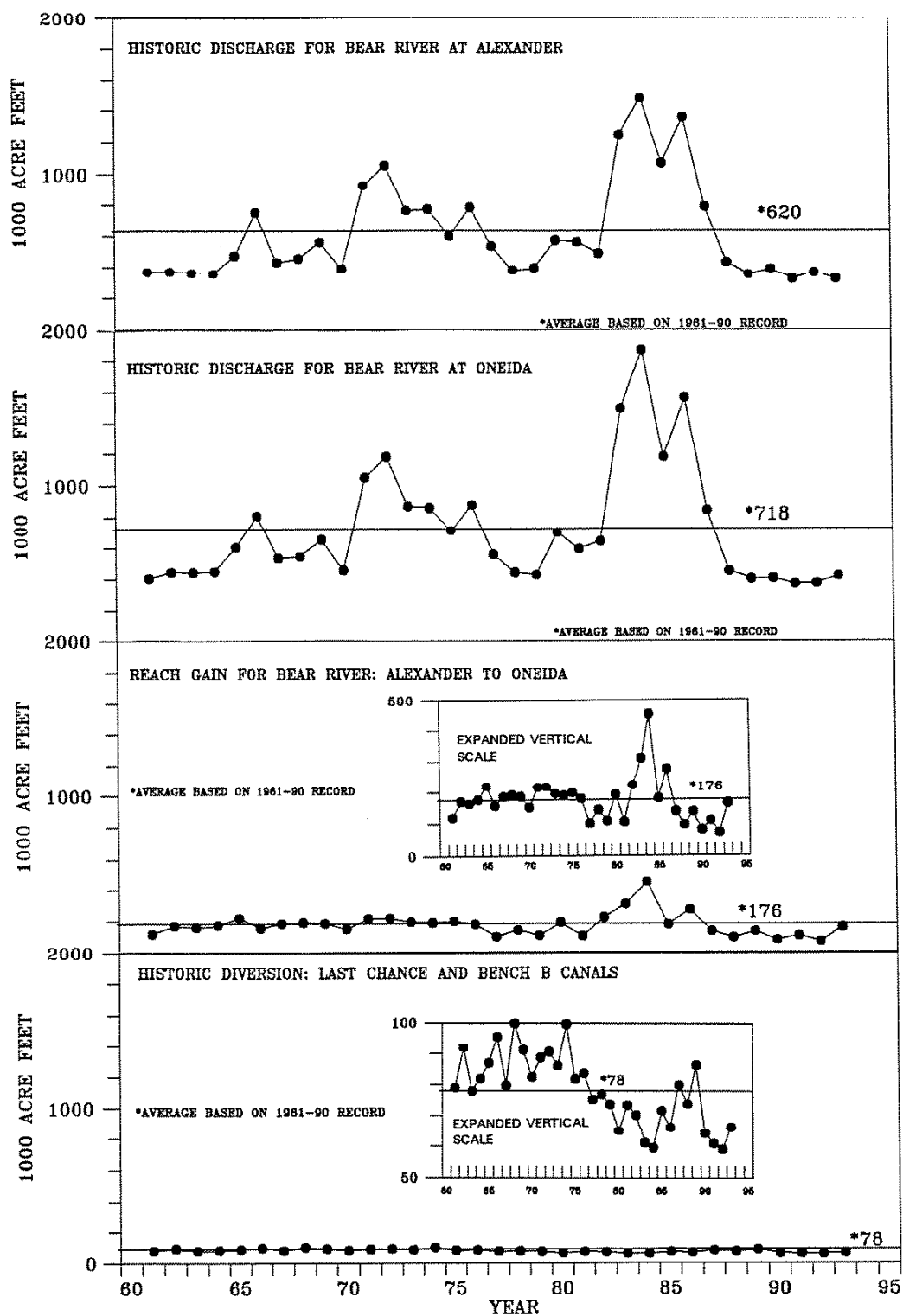


Figure 4. Surface Water Data

Bear River was north into the Portneuf River (see Figure 5 "Geologic Map" and Figure 1). At approximately that time, basalt flows dammed the Portneuf River creating historic Lake Thatcher which reached from the present day Portneuf River to Gentile Valley. The Basalt flows continued until all but the northern and southern ends of the lake had been filled with basalt. Eventually the southern end became the final part of the lake and the only part in which lake sediments lie upon or cover basalts. The rest of the area has lake sediments underlying the basalt flows. Eventually weathering and erosion created the present day drainage system.

The basalts in Portneuf and Gem Valleys have an approximate thickness of 400 feet. No wells have fully penetrated the underlying lake sediments.

Occurrence and Movement of Ground Water

Figure 6, "Ground Water Contours", presents contours based on data collected in the fall of 1983 by the USGS. The ground water divide lies approximately in the center of T09S-R40E with a northeast-southwest trend. It is noted that the location is approximate and could change on a seasonal and/or yearly basis. Young (1984) and Baker (1989) using the same data set, developed somewhat more detailed or finite definitions of the line and flow direction.

The gradient to the northwest is relatively flat at 0.5 percent (5 feet per 1000 feet). To the south the gradient is much steeper at 3 percent (30 feet per 1000). This is also the area in which the basalts are overlain by lake sediments. Figure 7, "Cross Section", although idealized and only an illustration, shows that as ground water flows through the basalts and beneath the lake sediments, confined conditions are created with the lake sediments forming the confining layer. This is presented to help explain the reasons for the location and occurrence of the springs that are tributary to Bear River.

Recharge Versus Discharge

Figure 8, "Area Hydrographs" presents six hydrographs in the area. Five are located in the management area with the remaining one lying farther to the southeast. The records for #2, #5, and #6 date back to the late 1960's, while the other three date back approximately to 1980.

All appear to be following climatic effects. Well #5 does show an overall decrease since 1965 of approximately 10 feet, but more importantly also resembles diversion data. Therefore, since the diversions date back to the turn of the century, it is probable that ground water levels were artificially high and are decreasing as less water is being diverted. Well #6 is stable and #2 shows a slight increase. Records

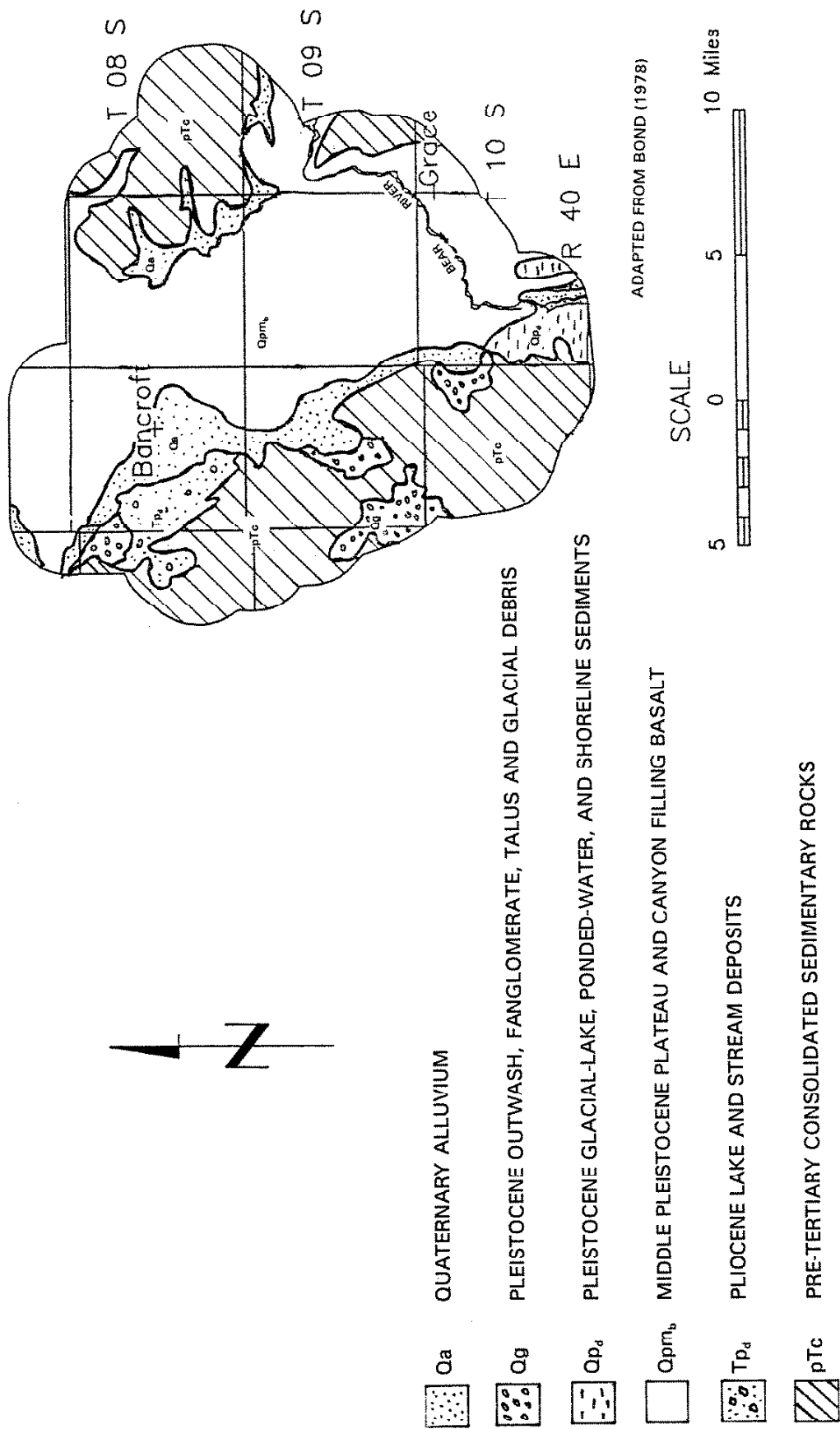


Figure 5. Geologic Map

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BANCROFT-LUND GROUND WATER MANAGEMENT AREA

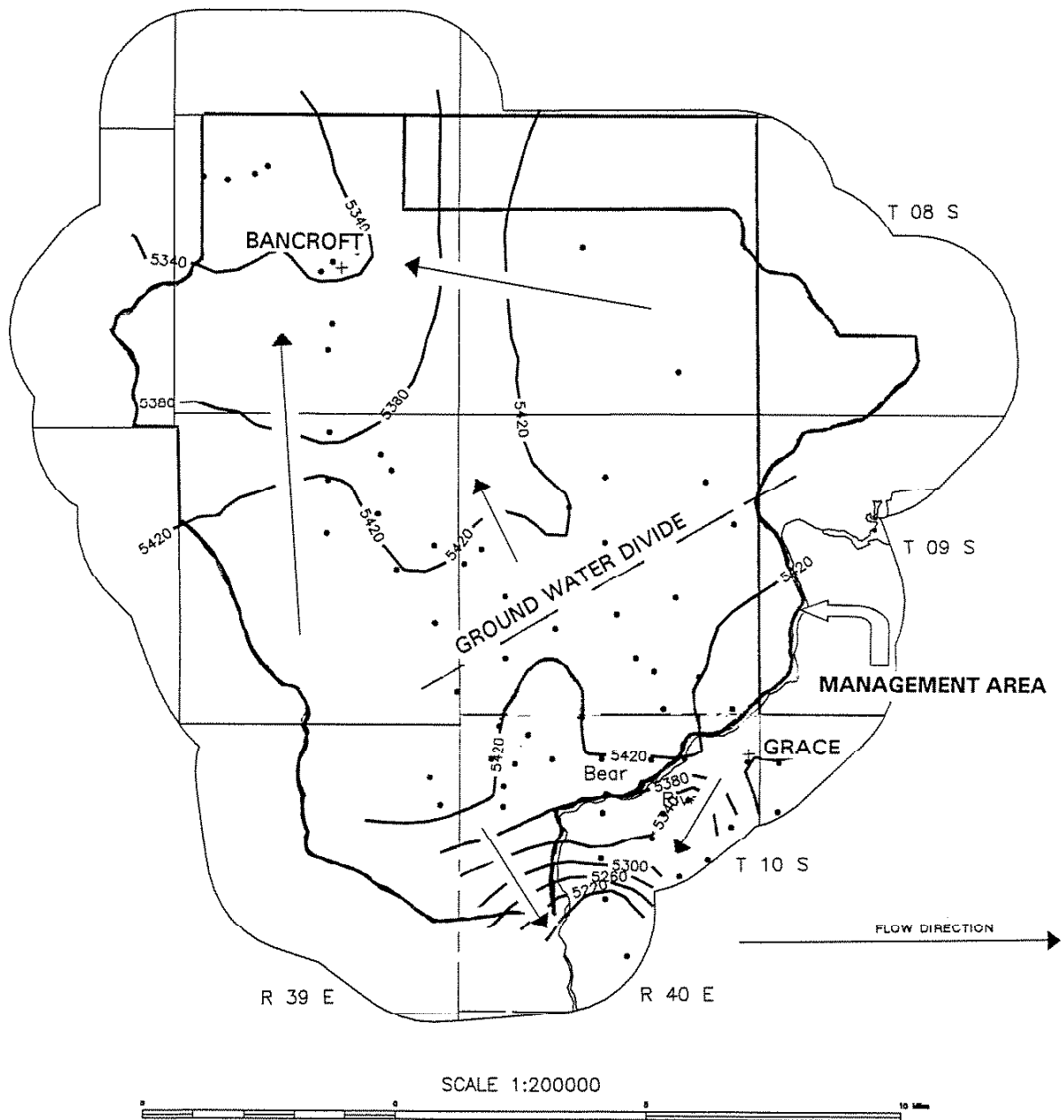


Figure 6. Ground Water Contours

LOOKING WEST

ACROSS BIG BEAR RIVER

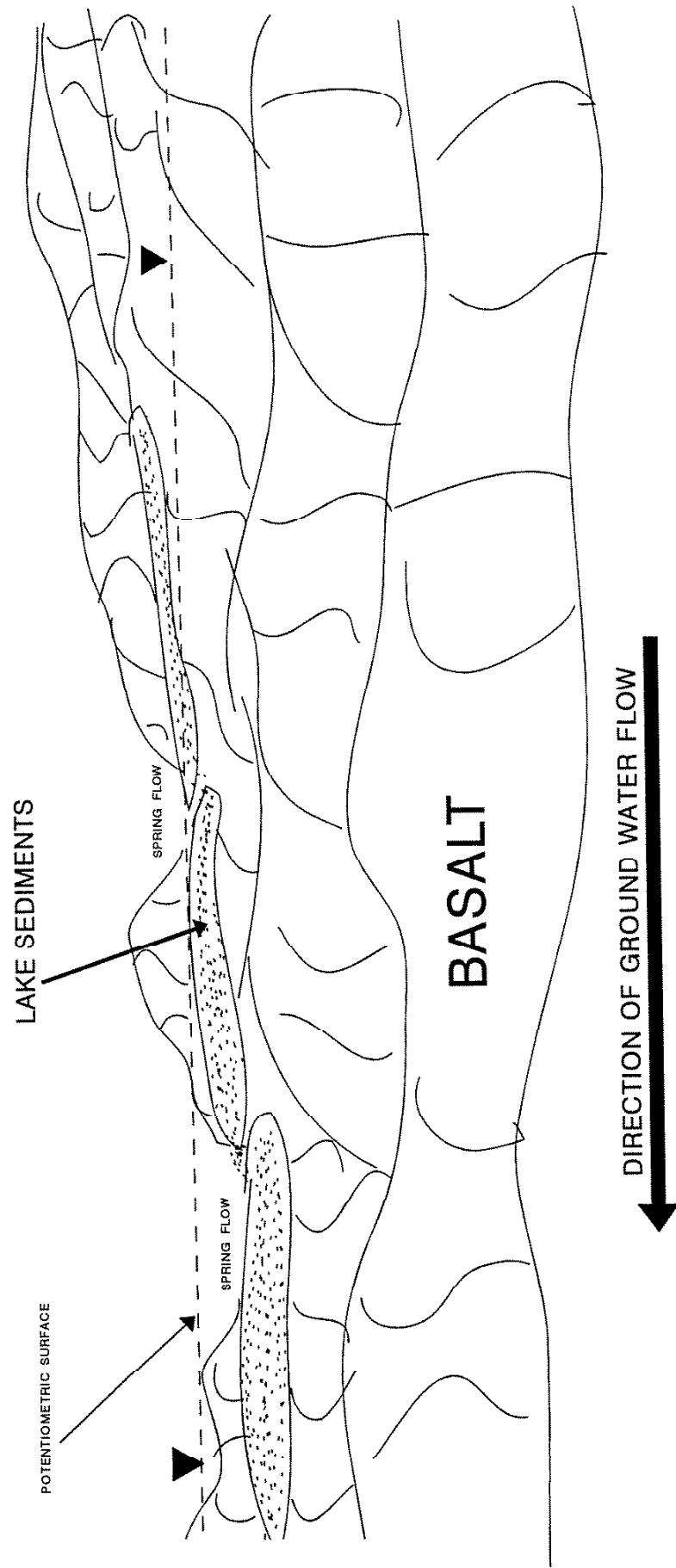


Figure 7. Cross Section

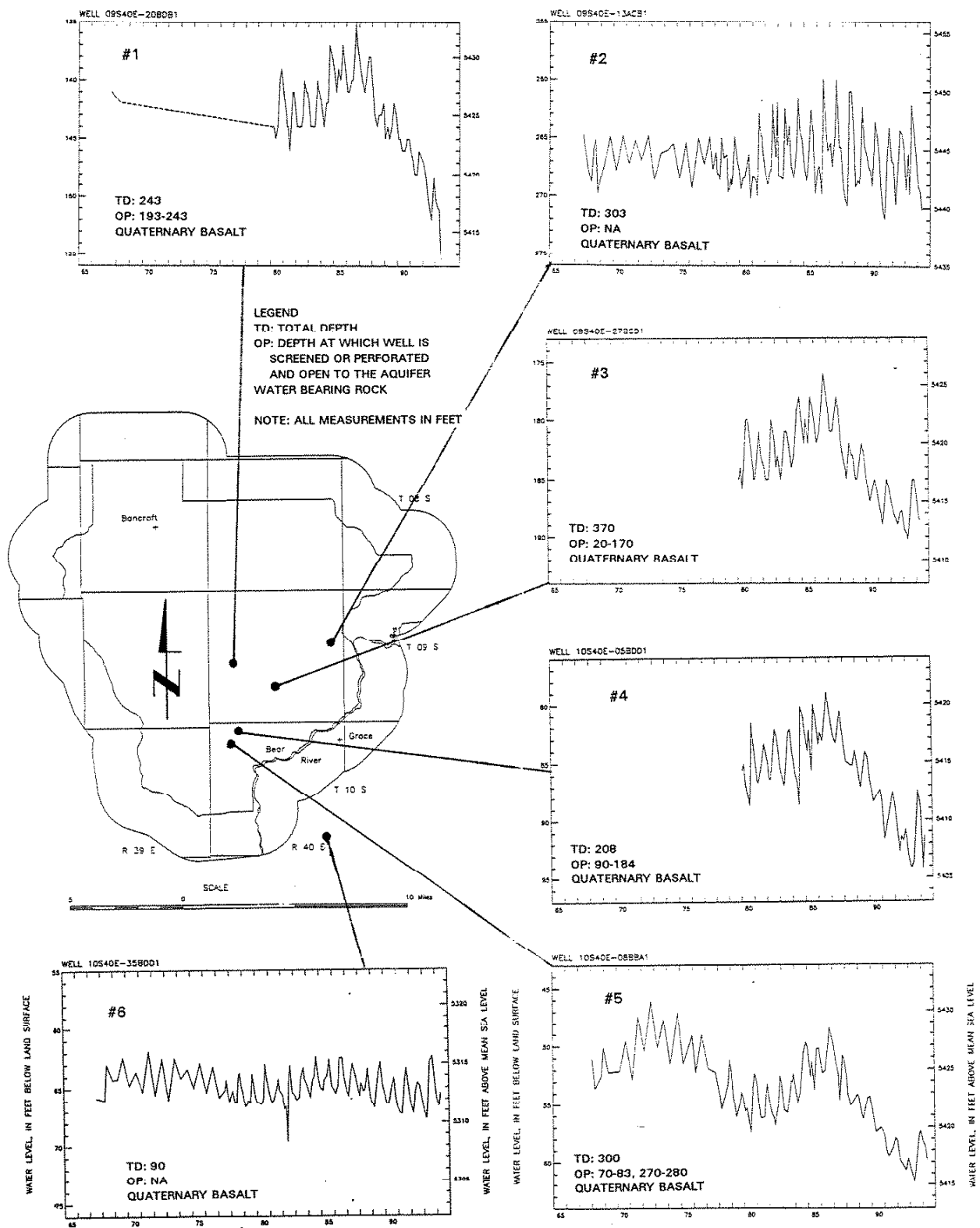


Figure 8. Area Hydrographs

for the other three are less extensive, but do reflect a similar trend seen in the hydrograph for well #5.

The increase in #2 is probably related to its location. It is upgradient from most irrigation wells, water diverted for irrigation and also near Alexander Reservoir. Dion (1969) stated that the reservoir probably gained from ground water on the eastern end and lost to the ground water system on the western end. It is also more reflective of snow course data. The other wells could be indirectly reflecting climatic data by responding to wet and dry years with decreased and increased pumping and Bear River diversions.

Well #3 was discontinued in the spring of 1993, but the other five responded to the wet year of 1993.

Precipitation in the uplands adjoining Bear River and water diverted for irrigation are the major sources of recharge for the aquifer. Dion (1969) stated that the Bear River was primarily a gaining stream as it traversed through Idaho. The one exception is the reach between Alexander and Grace. Some of this recharge, however, returns to the river as spring flow at Black Canyon.

Discharge from the management area is mainly from underflow from Gem Valley to the south, Portneuf Valley to the north, spring flow into Bear River and pumpage. Much of the underflow passing south though, does return to the Bear River as spring flow.

CONCLUSIONS

The best indicator for the area may be the comparison between the hydrographs for well #2 and wells #1, #3, #4, and #5. The upgradient well #2 has an overall different trend than the others and may be more reflective of trends associated only with natural recharge. Whether the decrease in well #5 is due to pumpage or less water diverted, is not known. The hydrograph for the most downgradient well, #6, which is out of the management area, is not reflective of decreasing water levels.

The present monitoring system is sufficient and should not be changed.

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